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Voter Identification and Detection System using RFID and GSM to stop rigging in the elections

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Abstract: The aim of the paper is to design and implement a secured voting system which utilizes the RFID and GSM technologies along with the Electronic Voting Machine to further improve the election process and to avoid rigging. We have developed a system which gives access to the EVM through passive RFID and GSM module. The system we have developed uses a microcontroller, a RFID reader and a GSM module. Here the voter needs to have a voter identity card with passive RFID tag printed on it. When the voter comes to the polling booth to exercise his franchise, he is directed to swipe his voter identity card on a RFID reader. The RFID reader senses the voter ID and sends this information to the microcontroller. After receiving the voter ID the microcontroller, checks weather the received voter ID belongs to the particular polling booth or not. If the voter ID belongs to the particular booth, the microcontroller generates an OTP (one time password) and sends it to the registered mobile of the corresponding voter through the GSM module. The voter has to enter this OTP using the keyboard connected to the microcontroller. If this OTP matches, the microcontroller sends an enabling control signal to the EVM to make it ready for voting. This process continues for each voter.

Keywords: EVM, RFID, GSM, OTP, Voting

I. INTRODUCTION

Election is a basic process that occupies a prominent place in any democratic country. Many countries are using technology to effectively conduct elections and to smoothen the process. Recently a massive general election process concluded in India. Electronic Voting machines are used effectively in these elections. Though the election commission took extreme care, here and there some rigging and malpractices were reported during this election process. It is a difficult task for the polling officials also for identifying the authenticity of the voter and to stop rigging. If a sophisticated electronic identification system is developed to identify the voter, then the malpractices can be stopped and it will help the polling officials in their work. In that direction we thought of a system which can identify the voter ID and check the voter for authenticity. This paper is a product of that idea. Here Radio-Frequency Identification (RFID) based voter identification is employed. Microcontroller (AT89C51) is used analyse the data received from the RFID reader. The Microcontroller is provided with the data base of the all the voters and theirs voter Ids. After receiving the voter ID from the RFID reader, the Microcontroller compares the ID with its data base. If the voter ID belongs to that Polling booth, the microcontroller accepts the voter and sends a five character OTP to the registered mobile number of the voter through GSM module connected to it. The voter has to carry his registered mobile to the polling booth along with him/her. The OTP is used here to check the authenticity of the voter. If he/she receives the OTP and enters the same into the keyboard connected to the microcontroller, the microcontroller generates an enabling control signal to the EVM. Then the EVM gets ready for voting.

II. RELATED WORKS

In [1] door lock security system using RFID technology is discussed. In Sunrom technologies data sheet [2] RFID reader specifications are given. In [3] effective implementation of PDS using RFID and GSM technologies is discussed in detail. Using RFID and GSM in Bank Locker security is discussed in [4]. How a fuel distribution system can be made easier and effective is discussed in [5]. Intelligent SMS based metering system is discussed in [10]. Resources [6], [7]. [8] are used to study in detail the interfacing of the microcontroller with RFID, Keyboard and to write corresponding Assembly Language Programmes.

III. COMPONENTS USED

A. Microcontroller

AT89C51 Microcontroller is used here. It has following feature 4K Bytes of In-System Reprogrammable Flash Memory

- Fully Static Operation: 0 Hz to 24 MHz
- Three-level Program Memory Lock
- 128 x 8-bit Internal RAM
- 32 Programmable I/O Lines
- Two 16-bit Timer/Counters
- Six Interrupt Sources
- Programmable Serial Channel
- Low-power Idle and Power-down Modes

B. RFID

An RFID module consists of a tag and a reader. A typical RFID system consists of an antenna, a transceiver and a transponder (RF tag). The radio frequency is read by the

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transceiver and the information is transferred to a device for further processing. The information (the unique serial number) to be transmitted is stored in the RF tag or transponder. The transponder contains a chip and an antenna mounted on a substrate. The chip transmits the relevant information through antenna. The antenna also receives the electromagnetic waves sent by the RFID reader. Different RFID tags work on different frequencies. Here low frequency, 125 kHz, RFID tag has been used. This tag works within a range of 10 cm. When an RFID tag comes in this range, the reader detects it and sends a unique code of the tag serially. This serial code, consisting of 12 bytes, is received by the microcontroller.

In the prototype of the system we used SE-LS01-99-0125 RFID Module. This commercially available board comes with MAX 232 connectivity.

C. GSM Modem

GSM (Global System for Mobile Communications), is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones.

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone.

When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.
Here we used SIM900A GSM module. This is a plug and play GSM Modem with an easy to implement RS232 and TTL serial interface and works on frequencies 900/ 1800 MHz it uses the popular SIM900A module for all its GSM operations. It comes with a standard RS232 interface which can be used to easily interface the modem to microcontrollers and computers. The modem also features a serial TTL interface option. It comes with a SIM holder.

D. Keyboard interfacing

Here the matrix keypad having 16 keys is used to interface with the microcontroller. The keypad used here is having 4 rows and 4 columns. These rows and columns are connected to the microcontroller through its two ports. Here all the rows are connected to the Port 0, which is used as an output port. All the columns are connected to the Port 1, which is used as an input port.

Whenever a key is pressed, a row and a column gets shorted through that pressed key and all the other keys are left open. This indicates the microcontroller that the key is pressed. Once it is sure that one of key in the key board is pressed then the microcontroller tries to identify that key. To do this it first checks for particular row and then the corresponding column of the key board by a process called scanning. An assembly language programme can be written and dumped into the microcontroller to perform this scan continuously and detect the keys properly. Alternately a keypad encoder also can be used to connect the keypad to the microcontroller.

IV. BLOCK DIAGRAM

Different devices and components used in the prototype of system being proposed in the paper are shown in the block diagram in Fig 1.

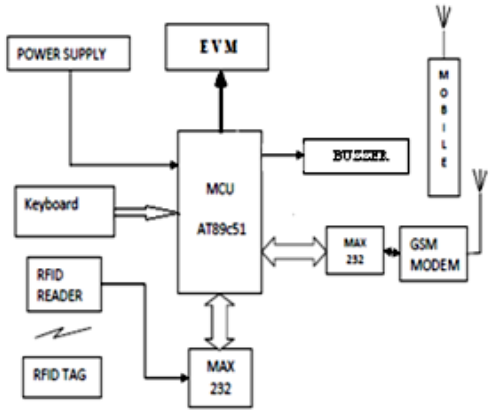

Fig. 1 Block Diagram of the System

V. IMPLEMENTATION

5V dc power supply is given to the microcontroller. In the place of the EVM a Buzzer is connected to indicate activation. For testing the circuit 20 Voter IDs are stored in the microcontroller. The registered mobile numbers of the voters and the numbers which are to be sent as OTPs are stored in appropriate locations in the microcontroller. Assembly language programme is written and dumped into the microcontroller to compare the RF scanned Voter ID with the Voter IDs present in the database. RFID & MAX 232 module is connected to the microcontroller to the serial communication pins 10 (RxD), 11 (TxD). Same way, the GSM module also is connected to the 10^{th} and 11^{th} pins of the microcontroller. The 4x4 matrix keypad is connected to the microcontroller through the keypad encoder 74 C 922. This encoder is connected to the four pins of Port 1 (p1.0-p1.3) and interrupt pin of the microcontroller.

A voter ID is brought near to the RFID reader the 12 byte code corresponding to the Voter ID is transmitted to the microcontroller. The microcontroller runs the programme to verify whether the ID matches with its database or not. If it does not match, the microcontroller activates a buzzer connected to the output pin (P2.0). If the ID matches with one of the IDs present in the microcontroller memory, the microcontroller sends a pre-stored number (OTP) to the voter's mobile through GSM Module. The voter receives this OTP from his registered mobile if he is a genuine voter. Then the voter has to enter the OTP using the keypad. The microcontroller checks the OTP sent by it and the OTP received by it through the Keypad. If these two OTPs match, the microcontroller sends an output signal to the EVM (Buzzer in this prototype) through output port pin P1.1. After the EVM getting activated the voter can cast his/her vote. The process repeats for all the voters in the particular booth.

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VI. SOFTWARE AND ALGORITHM

The main algorithm of the system is given in the form of flowchart below

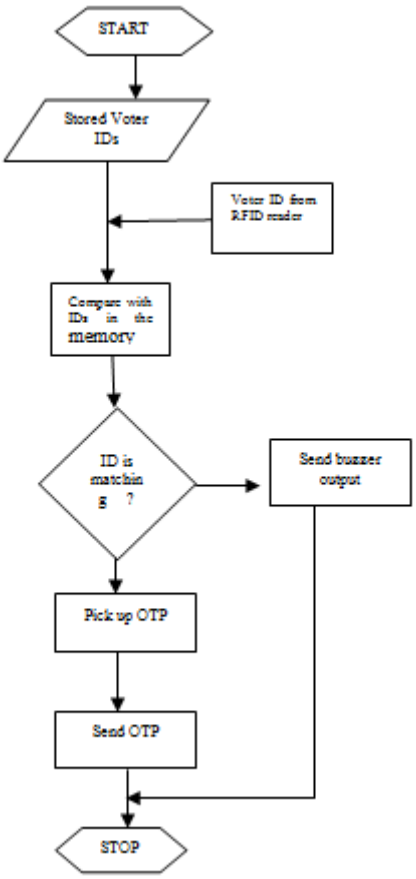

Fig. 2 Flowchart of the main process in the system

The programmes written in the Assembly langrage and the corresponding hex codes are developed using the assembler. The hex code is finally dumped into the microcontroller using the Topwin Universal Programmer.

VII. LIMITATIONS AND FUTURE SCOPE

In this paper we have taken a data base of 20 Voter IDs as a sample. The OTPs are pre stored numbers which are to be sent to the registered mobile number of the voter. In actual polling booth the number of voters will be much more. So an external memory can be used depending upon the number of voters in the booth. If required a PIC microcontroller can be used according to the necessity. Here we have used registered mobile number and OTP for authentication of the voter. The problem here is the voter must have a mobile phone and he/she has to carry the registered mobile to the polling booth. In future this can be replaced with face-detection technology.

VIII. CONCLUSION

In this paper we have shown the implementation of a system which minimizes the possibility of rigging in elections. The RFID and GSM based system works effectively and the cost of the system is also low. The system is convenient to use. It reduces the burden of the polling officials in identifying the voter.

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BIOGRAPHIES

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